

CLAIMS

1. A nozzle for an injection molding apparatus, comprising:
 - 5 a nozzle body, said nozzle body defining a nozzle body melt passage, wherein said nozzle body melt passage is adapted to be in fluid communication with an upstream melt source; a heater, wherein said heater is thermally connected to said nozzle body for heating melt in said nozzle body melt passage;
 - 10 a tip removably connected to said nozzle body, wherein said tip defines a tip melt passage therethrough, wherein said tip melt passage is downstream from and in fluid communication with said nozzle body melt passage, and is adapted to be upstream from and in fluid communication with a mold cavity in a mold component;
 - 15 a tip surrounding piece removably connected with respect to said nozzle body, wherein said tip surrounding piece is spaced from said tip; and a seal piece positioned between said tip and said tip surrounding piece, wherein said seal piece forms a seal with the tip and with the tip surrounding piece to inhibit melt leakage between the seal piece and the tip and between
 - 20 the seal piece and the tip surrounding piece, so that, in use, at least a portion of said tip and at least a portion of said tip surrounding piece are separated by an air gap.
2. A nozzle as claimed in claim 1, wherein the thermal conductivity of said seal piece is less than the thermal conductivity of said tip.
3. A nozzle as claimed in claim 1, wherein the thermal conductivity of said tip surrounding piece is less than the thermal conductivity of said tip.
- 30 4. A nozzle as claimed in claim 1, wherein said tip surrounding piece is configured to contact said mold component.

5. A nozzle as claimed in claim 4, wherein said tip surrounding piece is made of a material that inhibits heat transfer between said nozzle and said mold component.
- 5 6. A nozzle as claimed in claim 1, wherein said tip surrounding piece is configured to cooperate with said mold component to seal against melt leakage therebetween.
- 10 7. A nozzle as claimed in claim 1, wherein said tip has a first threaded portion for mating with a corresponding second threaded portion on said nozzle body.
- 15 8. A nozzle as claimed in claim 7, wherein said tip surrounding piece has a third threaded portion for mating with a corresponding fourth threaded portion on said nozzle body.
9. A nozzle as claimed in claim 1, wherein said tip surrounding piece retains said tip in place through said seal piece.
- 20 10. A nozzle as claimed in claim 1, wherein said tip surrounding piece is configured to align said nozzle with respect to a gate into said mold cavity in said mold component.
- 25 11. A nozzle as claimed in claim 1, further comprising an insulator piece, wherein said insulator piece is connected to said nozzle body and said tip surrounding piece is connected to said insulator piece.
- 30 12. A nozzle as claimed in claim 1, further comprising a fourth piece, wherein said fourth piece is connected to said nozzle body and said tip surrounding piece is connected to said fourth piece and wherein said fourth piece has a lower thermal conductivity than the thermal conductivity of said tip surrounding piece.

13. A nozzle as claimed in claim 1, wherein the seal piece is positioned proximate the gate-facing end of at least one of the tip and the tip surrounding piece.

5

14. A nozzle for an injection molding apparatus, comprising: /
a nozzle body, said nozzle body defining a nozzle body melt passage, wherein said nozzle body melt passage is adapted to be in fluid communication with an upstream melt source;

10 a heater, wherein said heater is thermally connected to said nozzle body for heating melt in said nozzle body melt passage;

15 a tip removably connected to said nozzle body, wherein said tip defines a tip melt passage therethrough, wherein said tip melt passage is downstream from and in fluid communication with said nozzle body melt passage, and is adapted to be upstream from and in fluid communication with a mold cavity in a mold component;

20 a tip surrounding piece removably connected with respect to said nozzle body, wherein said tip surrounding piece is free of contact with said tip, and wherein said tip surrounding piece and said tip are spaced from each other by a gap; and

a seal piece positioned between said tip and said tip surrounding piece, wherein said seal piece seals against both said tip and said tip surrounding piece to inhibit leakage of melt therepast into at least a portion of said gap.

25 15. A nozzle as claimed in claim 14, wherein the thermal conductivity of said seal piece is less than the thermal conductivity of said tip.

16. A nozzle as claimed in claim 14, wherein said tip has a first threaded portion for mating with a corresponding second threaded portion on said 30 nozzle body.

17. A nozzle as claimed in claim 16, wherein said tip surrounding piece has a third threaded portion for mating with a corresponding fourth threaded portion on said nozzle body.
- 5 18. A nozzle as claimed in claim 14, wherein said tip is removably connected to said nozzle body.
19. A nozzle as claimed in claim 14, wherein said tip surrounding piece retains said tip in place through said seal piece.
- 10 20. A nozzle as claimed in claim 14, wherein said tip surrounding piece is configured to align said nozzle with respect to a gate into said mold cavity in said mold component.
- 15 21. A nozzle as claimed in claim 14, wherein said tip surrounding piece is configured to cooperate with said mold component to seal against melt leakage therebetween.
22. A nozzle as claimed in claim 14, wherein the seal piece is positioned proximate the gate-facing end of at least one of the tip and the tip surrounding piece.
- 20 23. A nozzle for an injection molding apparatus, comprising:
a nozzle body, said nozzle body defining a nozzle body melt passage,
25 wherein said nozzle body melt passage is adapted to be in fluid communication with an upstream melt source;
a heater, wherein said heater is thermally connected to said nozzle body for heating melt in said nozzle body melt passage;
a tip, wherein said tip removably contacts said nozzle body, wherein
30 said tip defines a tip melt passage therethrough, wherein said tip melt passage is downstream from and in fluid communication with said nozzle

body melt passage, and is adapted to be upstream from and in fluid communication with a mold cavity in a mold component;

- a tip surrounding piece removably connected with respect to said nozzle body, wherein said tip surrounding piece is free of contact with said tip,
- 5 and wherein said tip surrounding piece and said tip are spaced from each other by a gap; and

- a seal piece positioned between said tip and said tip surrounding piece, wherein said seal piece forms a seal with the tip and with the tip surrounding piece to inhibit melt leakage between the seal piece and the tip and between
- 10 the seal piece and the tip surrounding piece, so that, in use, at least a portion of said tip and at least a portion of said tip surrounding piece are separated by an air gap,

and wherein said tip surrounding piece retains said tip in place through said seal piece.